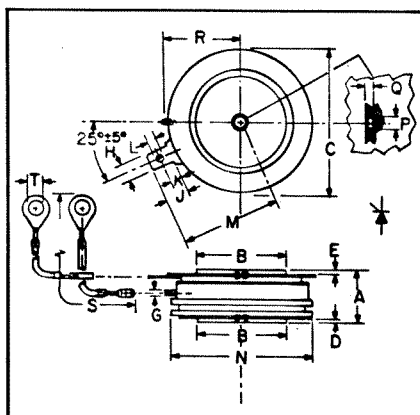
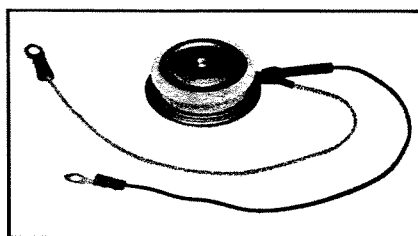


### Phase Control SCR 450-600 Amperes Avg 500-1800 Volts



**C431**  
**Outline Drawing**

| Dimensions | Inches |        | Millimeters |        |
|------------|--------|--------|-------------|--------|
|            | Min.   | Max.   | Min.        | Max.   |
| A          | .560   | .605   | 14.22       | 15.37  |
| B          | .985   | .995   | 25.01       | 25.27  |
| C          | 1.600  | 1.650  | 40.64       | 41.91  |
| D          | .030   | —      | .76         | —      |
| E          | .040   | —      | 1.01        | —      |
| G          | .057   | .059   | 1.44        | 1.50   |
| H          | .186   | .191   | 4.72        | 4.85   |
| J          | .245   | .255   | 6.22        | 6.48   |
| K          | .115   | .130   | 2.92        | 3.30   |
| L          | .064   | .070   | 1.62        | 1.78   |
| M          | —      | 1.120  | —           | 28.45  |
| N          | —      | 1.585  | —           | 40.26  |
| P          | .135   | .145   | 3.42        | 3.68   |
| Q          | .070   | .084   | 1.77        | 2.13   |
| R          | —      | .875   | —           | 22.23  |
| S          | 12.219 | 12.343 | 310.36      | 313.51 |
| T          | .137   | .153   | 3.47        | 3.89   |



**C431**  
**Phase Control SCR**  
450-600 Amperes/500-1800 Volts

#### Description

Powerex Silicon Controlled Rectifiers (SCR) are designed for phase control applications. These are all-diffused, Press-Pak (Pow-R-Disc) devices employing the field-proven amplifying (di/namic) gate.

#### Features:

- ☐ Low On-State Voltage
- ☐ High di/dt
- ☐ High dv/dt
- ☐ Hermetic Packaging
- ☐ Excellent Surge and I<sup>2</sup>t Ratings

#### Applications:

- ☐ Power Supplies
- ☐ Battery Chargers
- ☐ Motor Control
- ☐ Light Dimmers
- ☐ VAR Generators

#### Ordering Information

Example: Select the complete six or seven digit part number you desire from the table - i.e. C431T1 is a 900 Volt, 600 Ampere Phase Control SCR.

| Type | Voltage                              |      | Current              |      |
|------|--------------------------------------|------|----------------------|------|
|      | V <sub>DRM</sub><br>V <sub>RRM</sub> | Code | I <sub>T</sub> (avg) | Code |
| C431 | 500                                  | E    | 450                  | 2    |
|      | 600                                  | M    | 600                  | 1    |
|      | 700                                  | S    |                      |      |
|      | 800                                  | N    |                      |      |
|      | 900                                  | T    |                      |      |
|      | 1000                                 | P    |                      |      |
|      | 1100                                 | PA   |                      |      |
|      | 1200                                 | PB   |                      |      |
|      | 1300                                 | PC   |                      |      |
|      | 1400                                 | PD   |                      |      |
|      | 1500                                 | PE   |                      |      |
|      | 1600                                 | PM   |                      |      |



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**C431**  
**Phase Control SCR**  
450-600 Amperes Avg/500-1800 Volts

### Absolute Maximum Ratings

|                                                               | Symbol       | C431__1             | C431__2            | Units            |
|---------------------------------------------------------------|--------------|---------------------|--------------------|------------------|
| RMS On-State Current                                          | $I_{T(RMS)}$ | 950                 | 700                | Amperes          |
| Average On-State Current                                      | $I_{T(av)}$  | 600                 | 450                | Amperes          |
| Peak One-Cycle Surge (Non Repetitive) On-State Current (60Hz) | $I_{TSM}$    | 8000                | 6500               | Amperes          |
| Peak One-Cycle Surge (Non-Repetitive) On-State Current (50Hz) | $I_{TSM}$    | 7300                | 5950               | Amperes          |
| Critical Rate-of-Rise of On-State Current (Non-Repetitive)    | $di/dt$      | 150                 | 150                | Amperes/ $\mu s$ |
| Critical Rate-of-Rise of On-State Current (Repetitive)        | $di/dt$      | 100                 | 100                | Amperes/ $\mu s$ |
| $I^2t$ (for Fusing), One Cycle at 60Hz                        | $I^2t$       | $2.678 \times 10^5$ | $1.76 \times 10^5$ | $A^2sec$         |
| Peak Gate Power Dissipation                                   | $P_{GM}$     | 200                 | 200                | Watts            |
| Average Gate Power Dissipation                                | $P_{G(av)}$  | 5                   | 5                  | Watts            |
| Storage Temperature                                           | $T_{STG}$    | -40 to 150          | -40 to 150         | $^{\circ}C$      |
| Operating Temperature                                         | $T_J$        | -40 to 125          | -40 to 125         | $^{\circ}C$      |
| Mounting Force <sup>①</sup>                                   |              | 800-2500            | 800-2500           | lb.              |
| Mounting Force <sup>①</sup>                                   |              | 3.6-11.1            | 3.6-11.1           | kN               |

① Consult recommended mounting procedures.

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## C431

### Phase Control SCR

450-600 Amperes Avg/500-1800 Volts

## Electrical and Thermal Characteristics

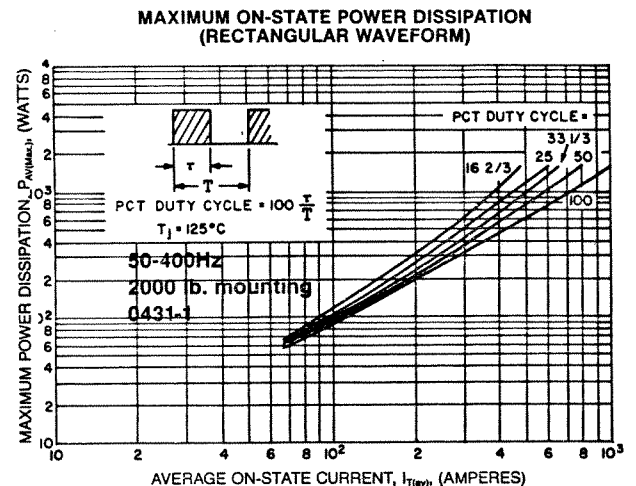
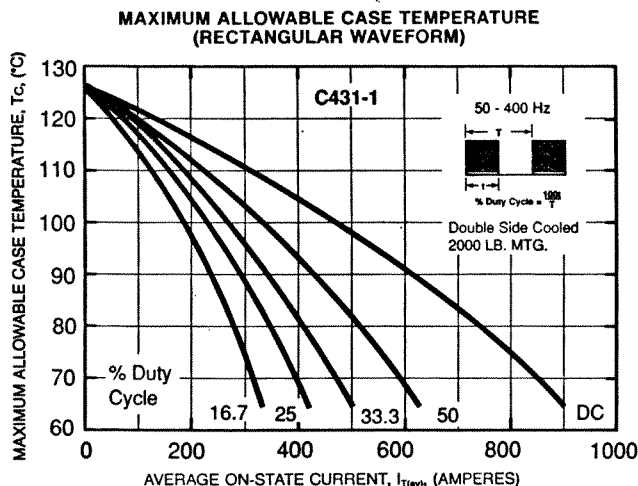
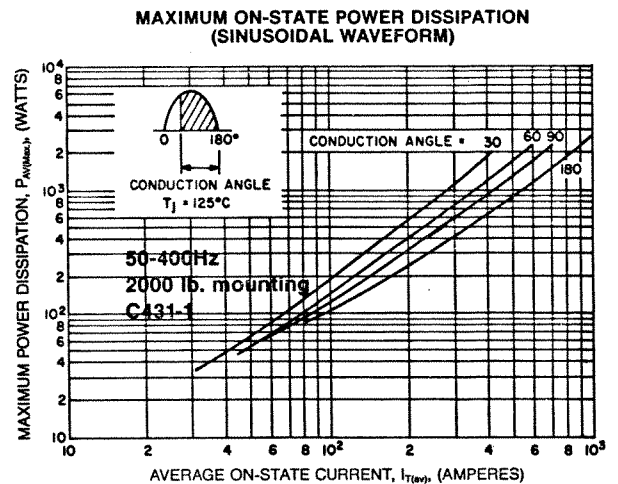
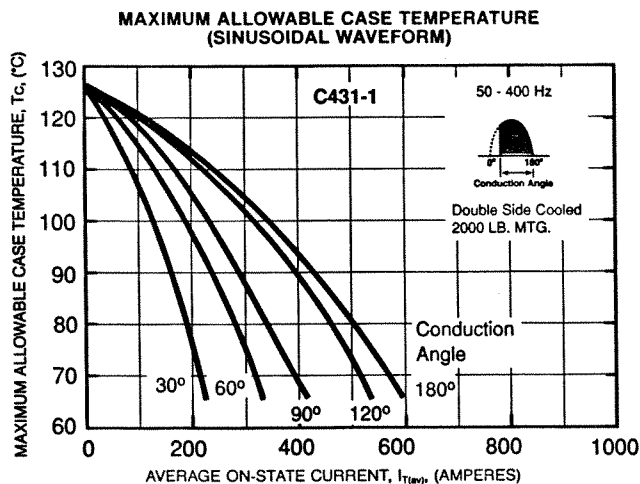
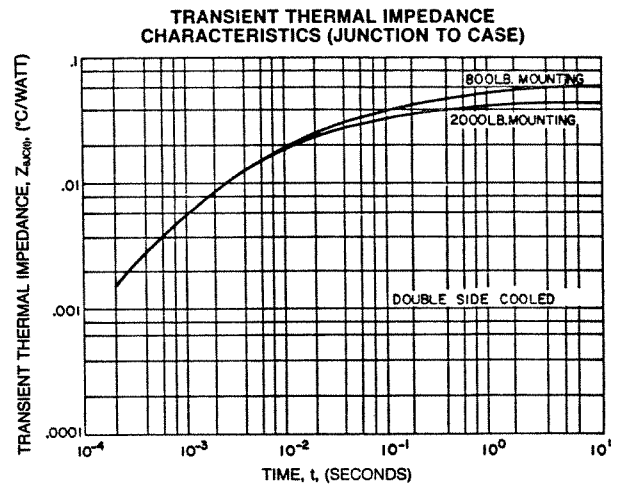
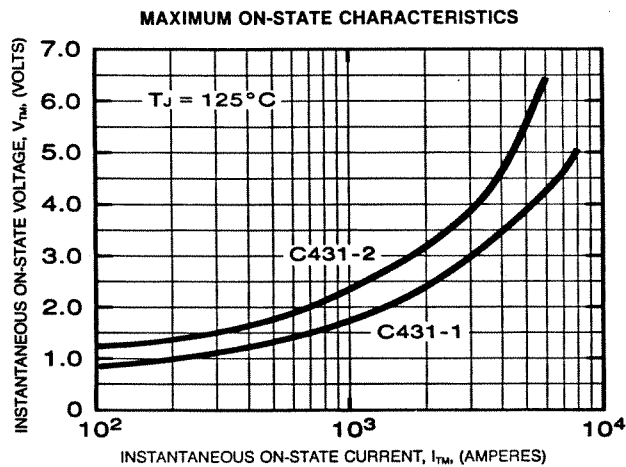
|                                                                  | Symbol          | Test Conditions                                                                                                                                                                                                                                 | C431__1           | C431__2 | Units           |
|------------------------------------------------------------------|-----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|---------|-----------------|
| <b>Current—Conducting State Maximums</b>                         |                 |                                                                                                                                                                                                                                                 |                   |         |                 |
| Peak On-State Voltage                                            | $V_{TM}$        | $I_{TM} = 3000A$ Peak, $T_J = 25^\circ C$ ,<br>Duty Cycle $\leq 0.01\%$                                                                                                                                                                         | 2.62              | 3.6     | Volts           |
| <b>Voltage—Blocking State Maximums</b>                           |                 |                                                                                                                                                                                                                                                 |                   |         |                 |
| Forward Leakage, Peak                                            | $I_{DRM}$       | $T_J = 125^\circ C$ , $V = V_{DRM}$                                                                                                                                                                                                             | 45                | 60      | mA              |
| Reverse Leakage, Peak                                            | $I_{RRM}$       | $T_J = 125^\circ C$ , $V = V_{RRM}$                                                                                                                                                                                                             | 45                | 60      | mA              |
| <b>Switching</b>                                                 |                 |                                                                                                                                                                                                                                                 |                   |         |                 |
| Typical Turn-Off Time                                            | $t_q$           | $T_J = 125^\circ C$ , $I_{TM} = 500A$ ;<br>$V_R = 50V$ Min; $V_{DRM}$ (Reapplied);<br>$dv/dt = 20V/\mu sec$ (linear);<br>Commutation $di/dt = 25A/\mu sec$ ;<br>Repetition Rate = 1pps; Gate Bias<br>during Turn-Off Interval = 0V, $100\Omega$ | 200               | 75      | $\mu sec$       |
| Typical Delay Time                                               | $t_d$           | $T_J = 25^\circ C$ , $I_T = 50A$ , Gate Supply:<br>20V, $20\Omega$ , 0.1 $\mu sec$ rise time                                                                                                                                                    | <b>C431</b><br>.7 |         | $\mu sec$       |
| Min. Critical $dv/dt$ exponential to $V_{DRM}$                   | $dv/dt$         | $T_J = 125^\circ C$ , $V_{DRM} = .8$ Rated,<br>Gate Open                                                                                                                                                                                        | 200               |         | V/ $\mu sec$    |
| <b>Thermal and Mechanical</b>                                    |                 |                                                                                                                                                                                                                                                 |                   |         |                 |
| Maximum Thermal Resistance, <sup>Ⓢ</sup><br>double sided cooling |                 |                                                                                                                                                                                                                                                 |                   |         |                 |
| Junction to Case (2000 lb force)                                 | $R_{\theta JC}$ |                                                                                                                                                                                                                                                 | .045              |         | $^\circ C/Watt$ |
| Case to Sink, Lubricated (2000 lb force)                         | $R_{\theta CS}$ |                                                                                                                                                                                                                                                 | .02               |         | $^\circ C/Watt$ |
| <b>Gate—Maximum Parameters</b>                                   |                 |                                                                                                                                                                                                                                                 |                   |         |                 |
| Gate Current to Trigger                                          | $I_{GT}$        | $V_D = 6Vdc$ , $T_J = 25^\circ C$ , $R_L = 3\Omega$                                                                                                                                                                                             | 150               |         | mA              |
| Gate Voltage to Trigger                                          | $V_{GT}$        | $T_J = -40$ to $125^\circ C$ ,<br>$V_D = 6Vdc$ , $R_L = 3\Omega$                                                                                                                                                                                | 5                 |         | Volts           |
| Non-Triggering Gate Voltage                                      | $V_{GDM}$       | $T_J = 125^\circ C$ , Rated $V_{DRM}$ , $R_L = 1000\Omega$                                                                                                                                                                                      | .15               |         | Volts           |
| Peak Forward Gate Current                                        | $I_{GTM}$       |                                                                                                                                                                                                                                                 | 10                |         | Amperes         |
| Peak Reverse Gate Voltage                                        | $V_{GRM}$       |                                                                                                                                                                                                                                                 | 5                 |         | Volts           |

Ⓢ Consult recommended mounting procedures.



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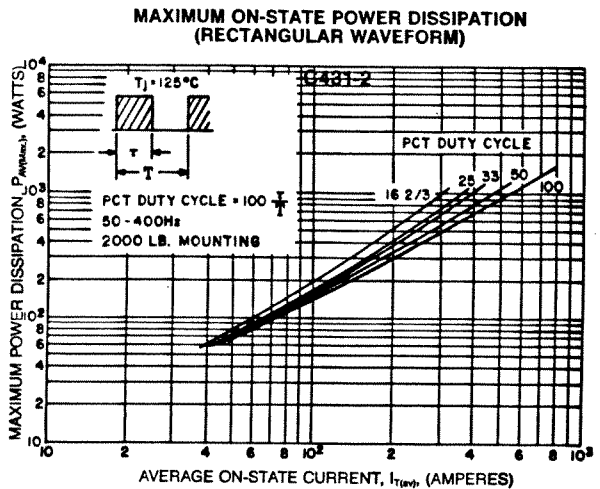
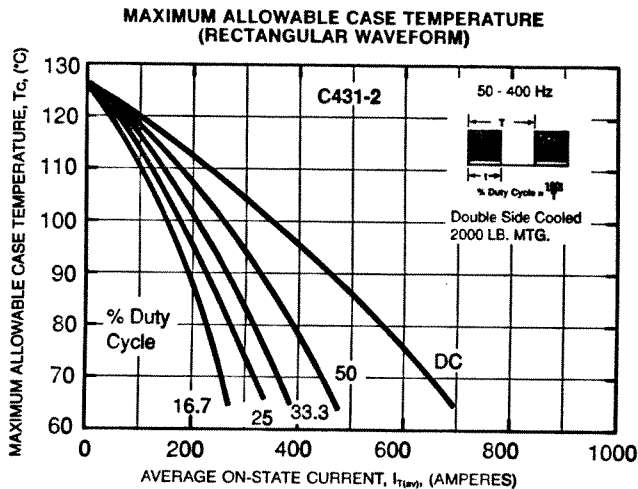
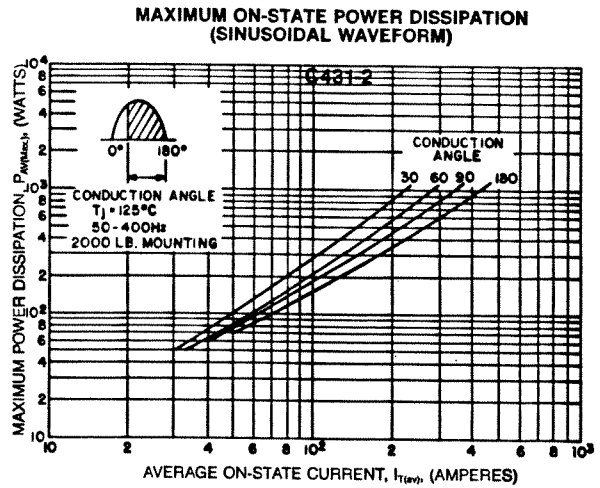
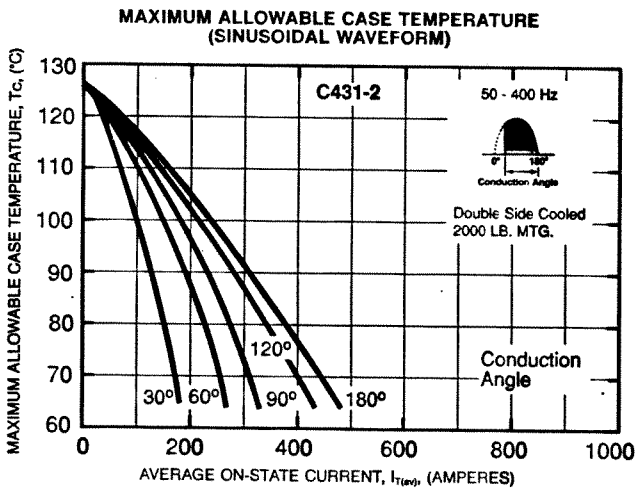
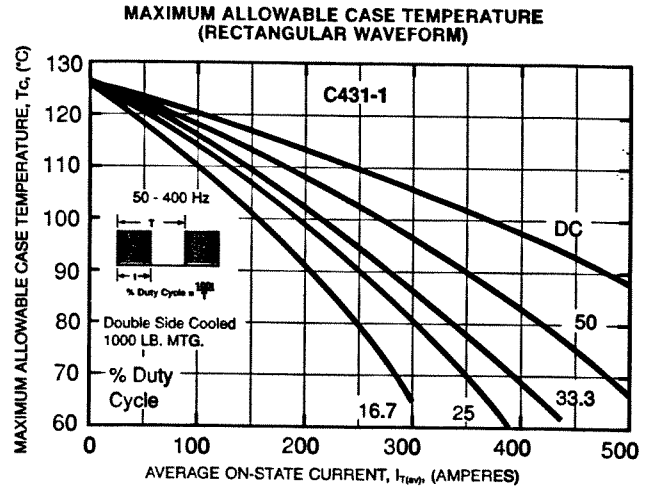
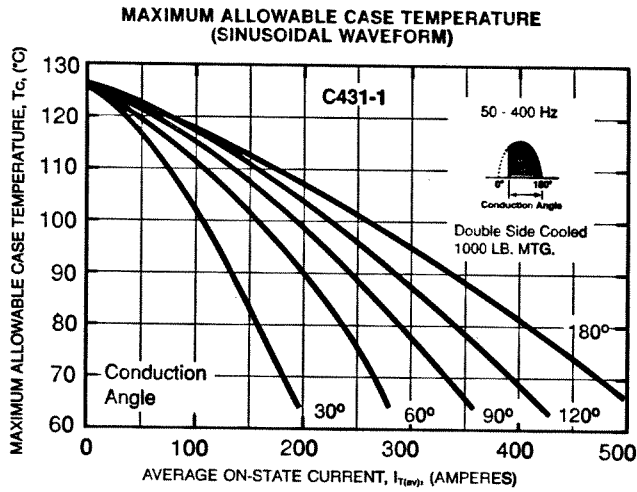
**C431**  
**Phase Control SCR**  
450-600 Amperes Avg/500-1800 Volts



## C431

### Phase Control SCR

450-600 Amperes Avg/500-1800 Volts



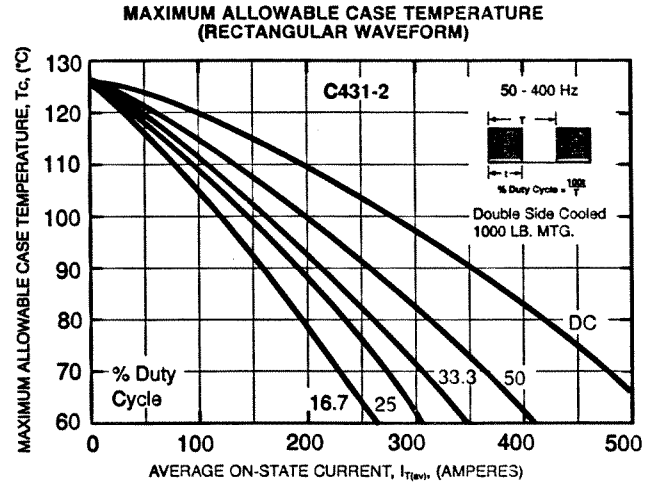
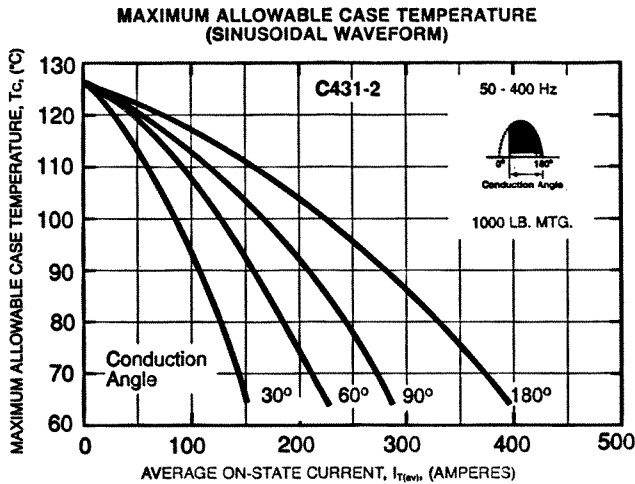
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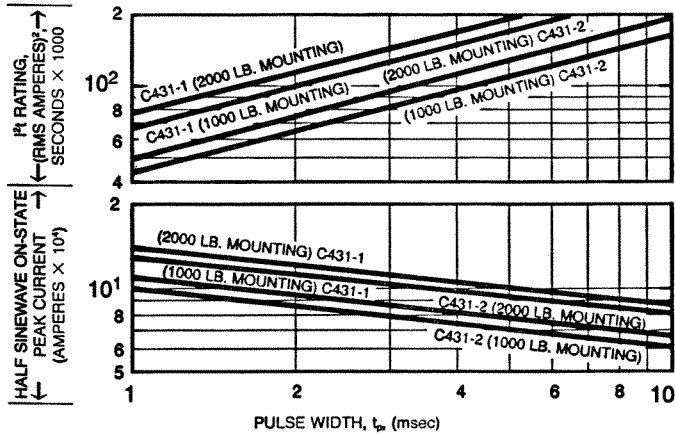
## C431

### Phase Control SCR

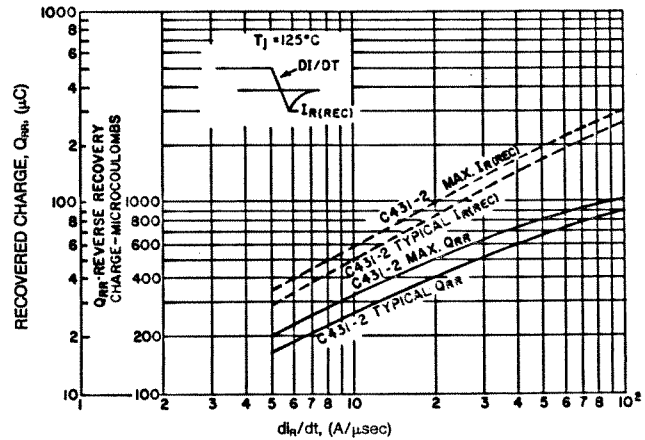
450-600 Amperes Avg/500-1800 Volts



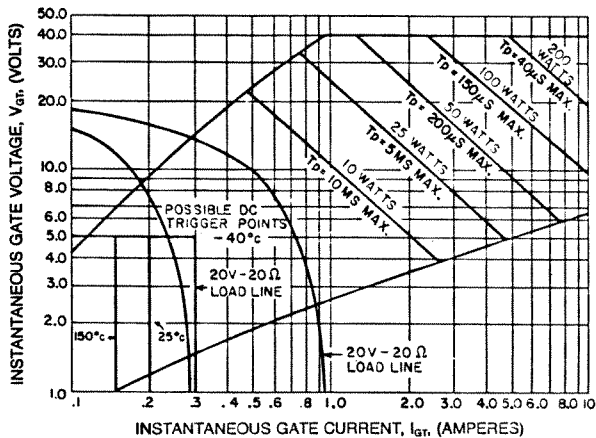
### SUB-CYCLE SURGE AND $I^2t$ RATINGS (RATED LOAD CONDITIONS)



### MAXIMUM RECOVERED CHARGE



### GATE CHARACTERISTICS



#### NOTES:

- Maximum allowable average gate dissipation = 5 watts.
- The locus of possible dc trigger points lie outside the boundaries shown at various case temperatures.
- $T_p$  = Rectangular gate current pulse width (5μs min. duration; 1.0μs max. rise time for 20V, 65Ω source).
- 20V - 20Ω is the minimum gate source load line when rate of circuit current rise > 100 Amp/μs or anode rate of current rise > 200 Amps/μs ( $T_p = 5\mu\text{s}$  min., 0.5μs max. rise time).

Maximum long-term repetitive anode  $di/dt = 500 \text{ Amps}/\mu\text{s}$  with 20V - 20Ω gate source.